BT

European Union

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

AU-IBAR

Farming in Tsetse Controlled Areas

FITCA

FARMING IN TSETSE CONTROLLED AREAS
FITCA

Environmental Monitoring and Management Component

E M M C

Project Number : 7.ACP.RP.R. 578

FITCA-EMMC workshops on information exchange and training with rural communities on environment: Western Kenya. Report and recommendations.

Prof. Erastus KANG'ETHE, Bernard TOUTAIN, Joseph MAITIMA
Julia KARUGA, Simon MBUGUA, Dorcas MBUVI

December 2003

Natural Resources Institute

CIRAD

FITCA EMMC Report Number W2

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

OVERVIEW: FITCA Project

The regional project FITCA (Farming in Tsetse Controlled Areas) has a general objective to integrate tsetse control activities into the farming practices of rural communities such that the problem of trypanosomosis can be contained to the levels that are not harmful to both human and the livestock and environmentally gentle and integrated into the dynamics of rural development and are progressively handled by the farmers themselves. The Inter-African Bureau hosts the project for Animal Resources of the African Union (AU-IBAR) and covers areas with small scale farming in Uganda, Kenya, Tanzania and Ethiopia.

EMMC (Environmental Monitoring and Management Component) is the environmental component of FITCA. It is implemented by ILRI in collaboration with CIRAD (as member of SEMG, Scientific Environmental Monitoring Group). This regional component has been charged with the responsibility of identifying of monitoring indicators and methodologies, as well as the development of an environmental awareness among the stakeholders. It contributes to propositions of good practices and activities mitigating the impacts and rehabilitating the threatened resources likely to result directly or indirectly of tsetse control and rural development.

The FITCA EMMC project was written by Dr. Robin Reid of the International Livestock Research Institute (ILRI) a future Harvest Centre supported by CGIAR (Consultative Group for International Agricultural Research).

The present report has been prepared under the responsibility of the leading group of EMMC:

- Dr Bernard Toutain, agronomist, coordinator
- Dr Joseph Maitima, ecologist

EXECUTIVE SUMMARY

1. Two workshops were held in Busia and Teso districts. Five villages from one location in the district were involved in the discussions. Participatory approach was used to gather information and perception of the participants on four themes: i) wetlands and water, ii) livestock and wildlife, iii) land and soils and iv) forests, woodlands and vegetation.

   The participants discussed the themes in their local dialects with the interpreter translating for the facilitator. It was clear that the changes in the themes were due to mans' activity and these changes were mainly; a) deforestation, b) poor soils, c) loss of wildlife, d) unsustainable cultivation in the wetlands and e) water pollution.

2. The effects of these changes on the incidences of sleeping sickness and *Nagana*[a] were related to habitat destruction in the forests, woodlands and vegetation and in wetlands. The effect of the changes on human livelihood had great impact on the participants for they had not pictured the unfolding scenario and its consequences before.

   The groups made a number of recommendations on the way forward in each theme and indicators to evaluate the changes in case the recommendations were followed through. One of the recommendations is the formation of village environmental committees and common interest groups to spearhead conservation and sustainable use of the natural resources at the village level. These groups if formed will require to undergo training in order to see through the implementation of the recommendations.

3. It is hoped that FITCA-EMMC will engage the communities' further in order to develop action plans which would be the village's blue print on environmental conservation, protection and management at the community level. Communities need to be networked to stakeholders with similar interests, who may assist them to implement the action plans.

[a] *Nagana*: animal Trypanosomosis

ACKNOWLEDGEMENTS

I wish to extend my sincere gratitude to the team who assisted in facilitating the workshops in the two sites namely: Bernard Toutain, Joseph Maitima and Julia Karuga. The work would not have been completed without the able assistance from a team of interpreters who made it easy for us to understand the discussions carried out in Ateso, and Lusamia.

I wish also to thank the District Environmental Officers in Teso and Busia districts for sparing their time to enlighten the participants on the government's role in environmental conservation and protection.

I wish to thank the communities of Angurai and Busia Township locations who participated in these discussions, for giving us their time and knowledge. It is my sincere hope they learnt as much as we did during the days we spent together. My thanks to the Chiefs, Assistant Chiefs and the ligulus who were on hand to meet us and made sure the workshops went on un hindered and were a success that they turned out to be.

Lastly, I am grateful to FITCA-EMMC for availing the funds to undertake this study.

INTRODUCTION

The environment is the business of everybody, development is the business of everybody, life and living is the business of everybody. We all have a stake in maintaining a healthy environment because we all depend on it.

In the quest for Kenya to become industrialized by the year 2020, there is need to set out goals for environmentally sound and sustainable development, where sustainable development refers to the development that meets the needs of the present, without compromising the ability of the future generations to meet their own needs. For this to happen Kenya needs to integrate environmental concerns into all existing and future economic and sectoral policies, in order to ensure that they protect and improve the environment and the natural resource base on which the health and welfare of the people depend. The enactment and coming into force of the Environmental Management and Coordination Act of 1999 (EMCA) and institutionalization of National Environmental Management Authority (NEMA) affords Kenyans the framework on which to address and take action on environmental issues.

These two workshops were held in Angurai in Teso district and Busia Township area in Busia district. The objectives of the workshops were: -

a) To share in a participatory manner the scientist and farmers perception on environmental themes forests, woodlands and vegetation; wetlands and water; land and soils and livestock and wildlife.

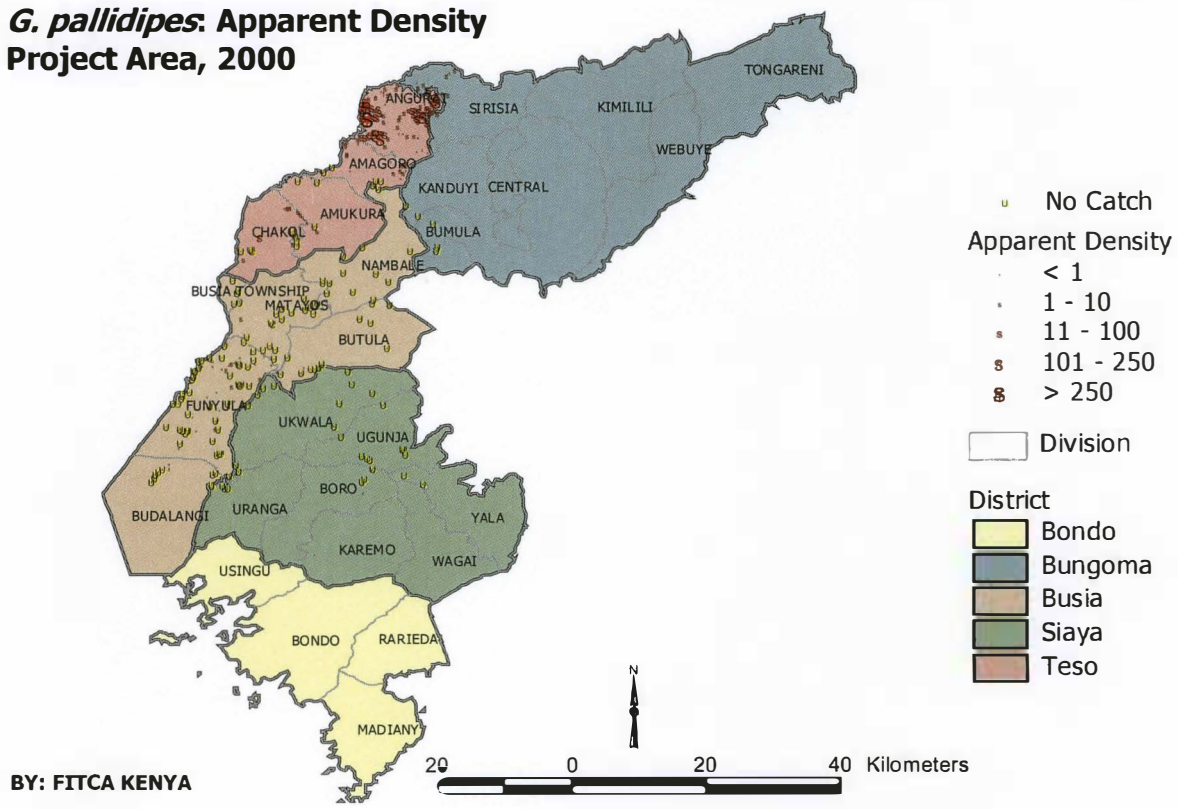
b) Formulate recommendations on the themes under discussion for the farmers and for a broader cross section of stakeholders concerned with such issues from FITCA's perspective

THE STUDY SITES

The workshops were held in two districts of the western province covered under the FITCA, Kenya activities. Five villages from one location in each district were invited to attend the workshop. The villages chosen were those FITCA-EMMC had done mapping to determine the land use patterns and collected data for social economic analysis. The areas chosen were those found to have high tsetse distribution by FITCA Kenya project (*Figure 1 and 2*) and therefore high risk of contracting sleeping sickness and *Nagana*.

The following villages were selected in the township location of Busia district: Nangwe; Mayenje; Bulanda/Burumba; Siteko/Mabale and Bwamani, while in Angurai location of Teso district, Kasinge A; Kaejo; Moru-Keneran; Kakurikit and Aukot were selected and invited to attend the workshops.

Fig. 1: The distribution of Glossina pallidipes in Western Kenya (FITCA Kenya Study area)



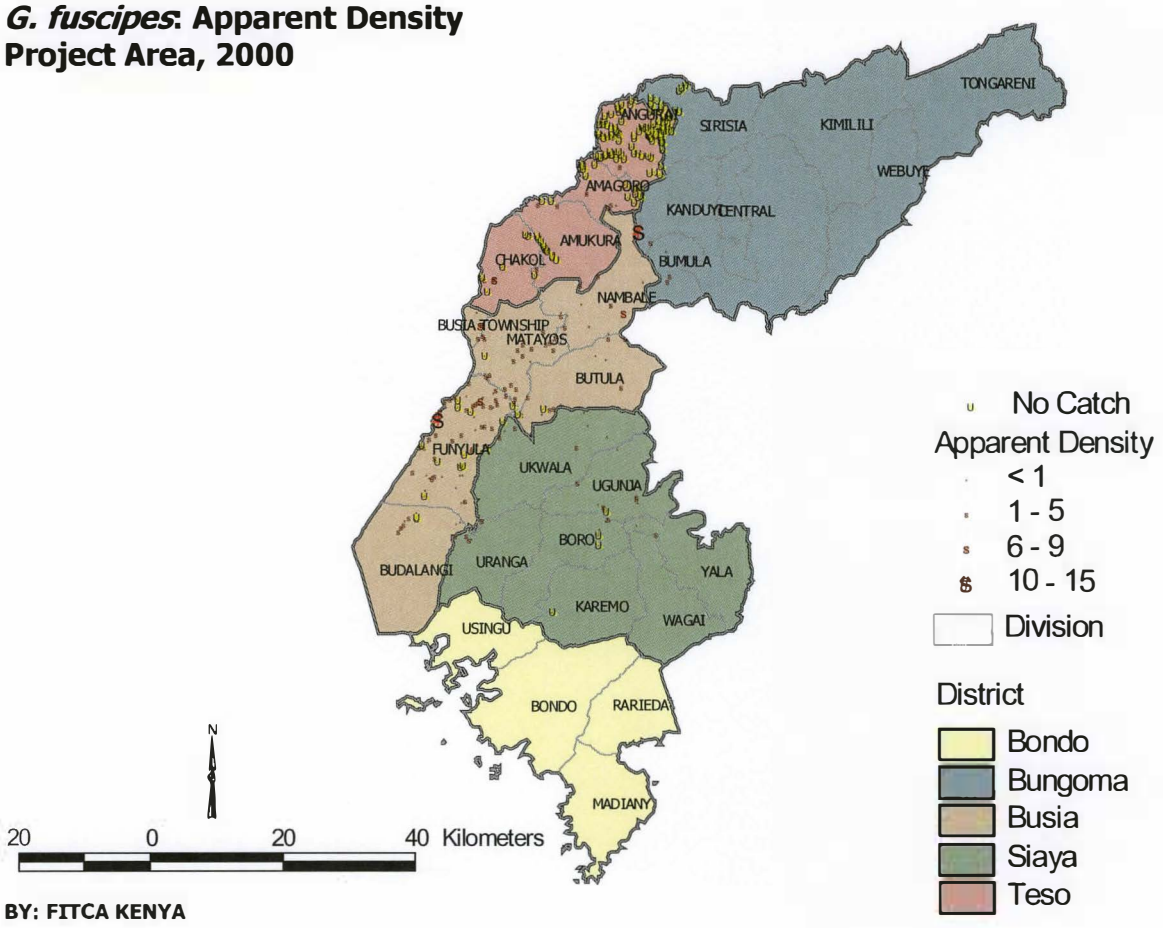


Fig. 2: The distribution of Glossina fuscipes in Western Kenya (FITCA Kenya Study area)

From each village, fifteen participants were invited amongst these six were women, one youth leader, the rest being men. The area Assistant Chief and village elder (Ligulu in Lusamia) were also asked to attend. In attendance was the location Chief. In Angurai, the meeting was held in the ACK church compound while in Busia the meetings were held in Farm View Hotel, Busia.

The workshop programme (*see Appendix 2*) involved two lectures one by the District Environment Officer to give the governments role and position on environmental conservation and the other by Dr. Bernard Toutain, the scientist's perception of the environment to set the mood for the discussions.

Government's role in Environmental Management and Conservation

District Environmental Officers from Teso and Busia presented the position and role of Kenyan Government on conservation and protection of the environment. The two officers, Valentine Lala and Stanley Ambasa who work for NEMA[b], offered the participants the genesis of environmental conservation efforts by the Kenyan government since 1963. Of importance is the consolidation of the various sectoral Acts that governed natural resources use into the EMCA[c] of 1999. The new Act does not only consolidate the relevant Acts into one but also establishes the NEMA which implements the Act and sets the structures, tools, standards and penalties to use while enforcing the Act. Of importance is that the Act has two principles of preservation and sustainable use.

Scientists' understanding of the Environment

Dr Toutain emphasized that environment is anything around us. He listed the elements of the environment as those in the local, regional and global aspects (notion of scale). He introduced the concept of ecosystem where each thing living or non-living is localized and has complex interrelationships with the biological and physical environment (notion of interactions). All ecosystems have a balance and when one element is removed from the web of relationship, the ecosystem is disturbed and becomes unhealthy (notion of balance in the system). The critical thing is what we do has a positive or negative effect on the environment, locally, regionally or globally (human's responsibility). It is our duty therefore, to protect, conserve and utilize the natural resources in our environment in a sustainable manner, in order to share this with future generations.

Groups of Discussion

The participants were divided into four groups and each group was given a theme to discuss through with a facilitator and an interpreter. The themes for discussion were a) forests, woodlands and vegetation; b) wetlands and water; c) land and soils and d) livestock and wildlife. After approximately six hours of deliberations, each group

[b] NEMA: National Environment Management Authority
[c] EMCA: Environmental Management and Coordination Act

presented its work in the plenary session, in order to inform others of the outcome and also build consensus on the recommendations and suggested indicators.

The following is the outcome of such plenary session presentations by the groups.

LIVESTOCK AND WILDLIFE

Definition
The two communities defined livestock, as domesticated animals including birds while wildlife are animals and insects that humans have no success in domesticating. Examples of livestock and wildlife were given as a proof of their ability to differentiate the two.

Goods and services provided by livestock and wildlife

Table 1: List of goods and services obtained from livestock and wildlife

Angurai	Busia Township
Livestock	
Goods	
Food (milk, meat, eggs and blood)	Food
Cow dung for smearing houses	Manure
Income	Income
Skins and hides	Hides and skins (bags, shoes & drums)
	Bones (making cups, jewellery, animal feed)
Services	
Draught power	Draught power
Security (dogs)	Transport
Entertainment (bull fighting)	Payment of dowry
Signaling time (cocks)	Security (dogs)
Rituals	Decoration (feathers, horns and flywhisk)
Hunting (dogs)	For rituals
Assets	Signaling time
Checking out dangerous wildlife (cats eats rats and kills snakes)	
Wildlife	
Goods	

Manure (bush for vegetation)	Bushmeat
Bush meat	Skins
Skin (python & leopard)	Manure
Medicinal value (python oil)	Income as tourists attraction
Jewellery (elephant tusk)	Making amulets (Iduhulu skin and rabbit fur)
Honey	
Services	
Tourist attraction	Tourist attraction
Seed dispersal	Balancing ecosystems
Pollination of flowers	Pollination
Balancing ecosystems	

Changes and their causes that have occurred in wildlife and livestock in the past thirty years

Changes

Livestock

1. Decreased in livestock numbers
2. Changes in livestock management (spraying, treatment and other disease control measures)
3. Introduction of improved breeds
4. Introduction of zero grazing practices
5. Reasons for keeping animals has changed from prestige to economical concerns
6. Use of improved yoke for draught power

Wildlife

1. Reductions in number of some species while others have disappeared completely.
2. Establishments of game reserves to protect wildlife
3. Less contact between wildlife and humans

Causes

Livestock

1. Diseases like ECF, *Nagana* and Newcastle disease in poultry
2. Reduced grazing land due to increased population pressure
3. Poverty has made many people to sell their livestock in order to meet household needs
4. Land subdivision has resulted in decline in communal grazing lands and the small plots cannot support a large number of livestock

5. Changes in livestock management resulting in many people adopting zero grazing, which does not allow big herds of livestock.
6. Family labor that used to look after livestock has now shifted attention to other economic activities like *boda boda*[d].
7. The cost of management of livestock has increased due to the high cost of drugs and veterinary fee.
8. Price of livestock products has increased due to high demand
9. Accessibility of markets for livestock products has led to intensification of livestock keeping.

Wildlife

1. Hunting for bush meat
2. Deforestation has caused habitat loss leading to migration of wildlife
3. Animal poisoning and trapping
4. Conservation efforts by government for foreign exchange earnings through tourism

Nature of the changes that have occurred in livestock and wildlife

Livestock

The positive effects of the changes

Keeping of livestock has increased household incomes as a result of improved production. Since the numbers of livestock kept have decreased, range herding has declined, thus reducing the number of tracks made by the animals going to watering points and the contributory effect of livestock tracks in causing soil erosion. Human-livestock conflicts caused by destruction of crops by animals have declined

Herding of livestock was a duty for children. Since livestock numbers have reduced, children have time now to attend school. Equally, farmers can concentrate on other farming activities because of zero grazing. Zero grazing has lead to improved sanitation at households because less cow dung is littered all over the compound thus few breeding sites for flies in the compounds. Farmers owning zero grazing units create job opportunities by providing employment on the farm to collect grass for animals or in the cooperative societies where animal products are processed.

The negative effects of the changes

Because of reduced numbers of livestock, the amount of manure collected is less. This means that farmers rely more on artificial fertilizers, which are very expensive, and leads to low crop yields and household food insecurity.

With few animals being kept, the demand for livestock products outstrips supply resulting in low protein intakes and risk of malnutrition in the vulnerable groups.

[d] service of transport of people and goods on bicycle

Livestock played a central role in marriages as dowry was paid using cattle. With people keeping fewer animals, dowry payment has declined leading to failure in cementing family relationships. Restocking for those without animals is very expensive because of the high prices of livestock. This has lead to lower exchanges of animal as gifts between families, a cultural practice that was aimed at helping people own livestock.

Wildlife

Positive effects of changes in wildlife

Wildlife endangers human life as well as livestock. Reduction in their numbers or total disappearance has given the population a sense of security for their own lives and that of their animals. This has reduced wildlife human conflict that causes losses of livestock, human life and crops. Government's effort in establishing game reserves and parks has increased security and has also attracted tourist into the country thus earning the country foreign exchange.

Negative effects of changes in wildlife

Wildlife was a source of bush meat, which was used to supplement protein intakes and also a source of hides and skins used for making traditional drums for "*sukuti*" dance. These have become expensive if at all they are available. Idleness has increased among men as they used to hunt wildlife as a pastime sport as well as providing meat for the family. Social cohesiveness in the community, which used to be knitted by such activities, has declined. Traditional medicine which was gotten from wildlife is no longer available thus the communities have lost valuable indigenous knowledge that will not be passed down from generation to generation. Theft has increased, as people no longer have fear of dangerous wildlife and can move at night to commit their heinous acts.

Effects of the changes on human livelihoods

Household food insecurity has increased because people used oxen to plough land. With reduction in livestock numbers people are now using hand hoes and are ploughing small pieces of land leading to less crop yields exacerbating famines (*see figure 3*).

Livestock was sold for school fees. With decline in the livestock numbers, the number of school dropouts has increased, as many cannot afford to pay school fees. This has widened the gap between the rich and poor.

Social contracts like marriages were cemented by payment of dowry in form of livestock. Now with fewer animals, such social- cultural activities are not honored and family break ups are on the increase as the value associated with the dowry is lost.

The cost of animal products has increased due to high demand low supply. More money is now spent buying these products increasing the household food budgets thus heightening poverty and malnutrition.

The disappearance or reduction in wildlife numbers has made bush meat very expensive when available. Cultural rituals that were performed using wildlife products have been lost because the paraphernalia used is no longer easily available. This has meant loss of cultural identity and knowledge.

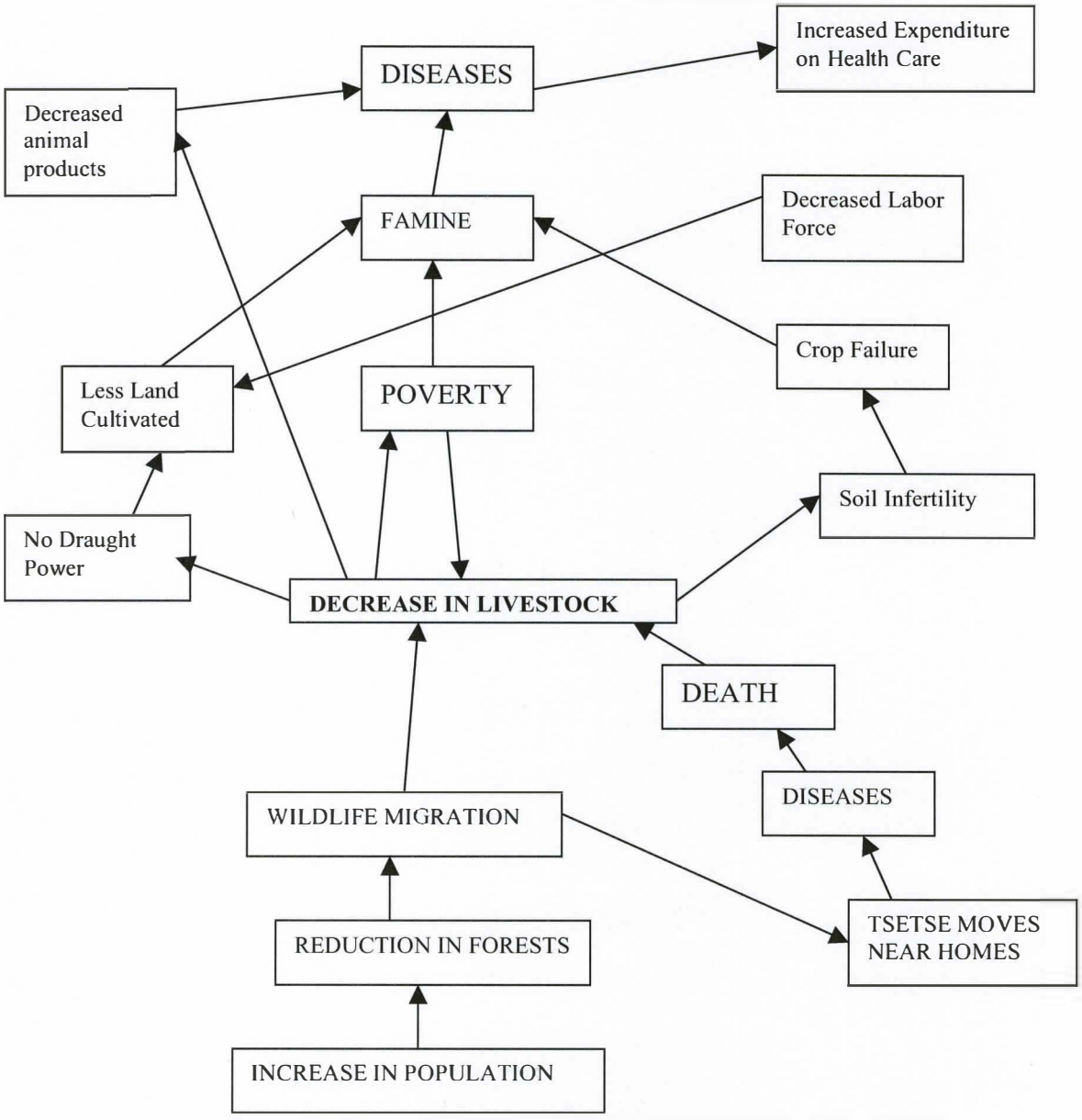


Fig. 3: The perception of the impacts of the changes in Livestock and wildlife (reduction in livestock *numbers) on livelihoods by Angurai community, Teso District*

How the changes in livestock and wildlife have affected sleeping sickness and Nagana

With reduction in wildlife and livestock numbers sleeping sickness incidences have increased.Wildlife is the preferred source of blood meals for tsetse and their disappearance tsetse have turned to alternative sources of blood meals which are humans and livestock, thus increasing the risk of contracting sleeping sickness and *Nagana*.New livestock management practices like zero grazing, using treated nets around zero grazing units and trapping of tsetse have reduced the incidences of *Nagana*.

Indigenous knowledge used to mitigate the changes in livestock and wildlife

The cattle kraals were fenced using thorny shrubs to prevented wildlife like hyenas, leopards from breaking in and killing them. Drumming and lighting fires at night were used to scare way the dangerous wildlife.

Medicinal herbs were used to treat a number of animal diseases. "*Orukini roots*" were used to treat anthrax while "*Esorui*" leaves were used to treat coughs. During foot and mouth disease outbreaks, the animals were taken early in the morning to the swamps and were made to walk in the muddy swamps. This was believed to heal the wounds. Animal quarantine was practiced to safeguard the healthy livestock from certain contagious diseases like foot and mouth disease. "*Sirongo*" a type of clay found in the wetlands was used as a dewormer for the animals. Taboos existed that prohibited certain clans from eating specific wildlife species. This acted as a conservation measure.

Changes that have occurred or are likely to occur due to FITCA activities

The current FITCA activities in the two communities are: -

1. Tsetse control by trapping, spraying and monitoring
2. Capacity building among farmers on better farming techniques
3. Vaccination of poultry
4. Bulking of new variety of cassava and introduction of sorghum variety
5. Helping farmers acquire grade animals

These activities are likely to result in: -

a. Increase in the number of livestock
b. Reduction in livestock diseases (Nagana and tick borne diseases).
c. Reduction in cases of sleeping sickness
d. Increase in household incomes, as less money will be spent on treatment of animal and human diseases.
e. Increased crop yields and animal products thus improving household food security
f. Soil fertility is bound to improve with application of organic manure from the zero grazing units

g. Where open pasture grazing is being practiced as in Angurai, increase in livestock numbers might lead to overstocking and consequently soil erosion. In Busia Township, improvement in the breeds of animal kept is likely to lead to more acreage udder fodder and this might cause encroachment on wetlands.

Recommendations

Afforestation
There is need to establish tree nurseries in order to encourage farmers to plant trees around their farms on the hedges and also establish woodlots. This will encourage the return of wildlife species like birds, which provide relaxation through their singing. It will provide wood fuel and also other economic returns.

Disease control
Efforts to control diseases like *Nagana* and other tick borne diseases should be continued as it will lead to decline in animal diseases and increase animal health and better incomes.

Upgrading of livestock
Increasing animal production will inevitably reduce poverty as increased milk and meat production will mean better household income. Farmers should be encouraged to upgrade the indigenous species by cross breeding using artificial insemination.

Overgrazing
Farmers should keep the number of animals their land is able to hold without risk of overgrazing. Encouraging farmers to adapt zero grazing will eventually reduce the number of livestock kept, overgrazing and soil erosion.

Indicators for measuring successful adoption of the recommendations

1. Increase in the number of farmers adopting zero grazing
2. Increase in the number of improved breeds of animals kept
3. Increase in the number of fodder crops planted
4. Increase in the number of tree nurseries established and trees planted.

Observations
Both Angurai and Busia Township areas have had good engagement with veterinary and FITCA staff. Issues of disease control are well understood and appreciated. There is need to build on this understanding in order to change the husbandry practices and increase returns from livestock keeping as an enterprise.

FORESTS, WOODLANDS AND VEGETATION

Definition
Forests are a collection of many species of trees, which are more than five meters high with touching canopies. Woodlands are a collection of many species of trees, which are more than five meters high but have no touching canopy. Forests and woodlands are composed of trees and shrubs.

Goods and services obtained from forests, woodlands and vegetation

Goods/products

Firewood	Timber	Paper
Herbs	Fruits	Poles
Charcoal	Thatching grass	Pastures
Fiber	Tubers	Seeds
Honey	Humus	Flowers

Services

Shade	Shelter	Windbreak
Role in hydrological cycle	Prevent soil erosion	Purifies air
Provides hunting ground	Protects soil moisture	Beautifies landscape
Attracts tourists	Provides income	Provides employment
Grazing grounds	Habitat for animals and insects	

Changes that have occurred in Forests, woodlands and vegetation the last thirty years

* [a] Changes with positive effects on livelihoods
[b] Changes with negative effects on livelihoods

1. Deforestation: old big indigenous trees have been cut down and forests have been cleared for cultivation because of increase in population * [a&b]
2. Land fertility has declined resulting in poor harvests [b]
3. Water catchment areas have been destroyed, this has caused water level to drop, some streams have dried up while others have become seasonal. [b]
4. Wildlife that had their habitat in the forests, woodlands and vegetation have disappeared, these include buffaloes, antelopes and hyenas [a&b]
5. Rainfall has become unreliable in quantity and duration [b]
6. Destruction of forests has caused a reduction in the availability of medicinal herbs and plants (*efsurut*- wild bananas; *etegtwa*- Albizia; *ekobwai*).[b]
7. Introduction of new exotic tree species (gravellier, pine and eucalyptus) [a]

Grevillea

Table 2: Causes of the changes occurring in forests, woodlands and vegetation

1). Deforestation	2). Population increase
3). Changes in land tenure	4). Increase in poverty
5) Ignorance	6). Urbanization
7). Construction of roads	8). Hunting
9). Brick making	10). Land degradation
11). New markets for crops	12). High unemployment

Impacts of these changes on human livelihood

Deforestation causes lack of wood fuel, high cost of forest products, and increase in soil infertility, erosion and low crop yields.

Destruction of water catchments areas results in insufficient water supply, increase in water pollution leading to outbreak of water borne diseases.

How the changes have affected the incidences of sleeping sickness and Nagana

Deforestation has reduced tsetse habitat and this has translated into a decrease in cases of sleeping sickness and *Nagana*.

Changes in land tenure has given rise to many speculative land owners who leave their land fallow thereby creating good habitats for tsetse and therefore increasing incidences of sleeping sickness and *Nagana*.

Increased awareness of FITCA's tsetse control methods and activities like tsetse trapping has reduced the tsetse numbers and the incidents of sleeping sickness and *Nagana*.

Bush burning has short-term beneficial effects of reducing fly numbers and therefore cases of the disease in humans and livestock, but on long term the bushes grow again (*Lantana camara*) and the condition is reversed.

Indigenous knowledge system used to mitigate the changes in forests, woodlands and vegetation

1) Deforestation

The communities identified some trees for conservation. These trees were either a source of medicine, windbreaks, sacred shrines for cultural worship or meeting places. Some trees were used to mark burial sites, homesteads, birthdays for children or considered sacred.

2) Population control

In order to control population growth, early marriages were not allowed. Men married after the age of 30 years. Once married, the couple practiced natural family planning to space children and give women time to nurse and care for the young ones. Prostitution and promiscuity, which is a source of many children born out of wedlock today, was prohibited and one was severely punished when found out.

3) Poverty

In order to cultivate large portions of land and ensure greater yields, the communities formed working groups, which would work on rotational basis on individual farms. This is not practiced today. The men and women used to have different gardens and granaries. The crops harvested from the mans' garden were stored in his granary and used as strategic family food reserve, accessed only during the famine or when they were sure of a bumper harvest in order to make room for the new produce.

4) Soil fertility

Shift cultivation ensured that the land lay fallow for a period in order to rejuvenate its soil nutrients. Communities also practiced intercropping so that some crop replenished soil nutrients while others used the same nutrients. This ensured that soils were not depleted of their nutrients and remained fertile.

Changes that have occurred or are likely to occur due to FITCA activities

FITCA has been working with two communities for the last three years and the following changes have occurred: -

1. Decrease in tsetse fly numbers, thus decrease in *Nagana* and sleeping sickness
2. Increase in livestock production
3. Increase in exotic animal breeds
4. Increase in better animal husbandry methods especially zero grazing
5. Increase in crop production due to increased use of oxen for ploughing and introduction of new crop varieties (cassava and sorghum)
6. Bush clearing around homesteads has reduced habitat for tsetse effectively reducing sleeping sickness and *Nagana*

Recommendations

Afforestation

Human activities have resulted in destruction of forests, woodlands and vegetation in general. The rehabilitation may be achieved by:

1. Establishing tree nurseries at village levels to serve as sources of planting materials for homesteads, along road reserves, on water catchments areas and along land boundaries.
2. Schools should be encouraged to set aside land where children will plant and care for their trees as a means of instilling the importance of trees in the young minds.
3. In order to minimize pressure on forests from the demands of fuel, communities should be encouraged to use alternative sources of fuel or use more efficient cooking stoves and better ways of burning bricks.

Indicators for measuring successful adoption of recommendations

1. Number of tree nurseries established
2. Number of households who have planted trees around their homes and along the land boundaries.
3. Number of schools with woodlots planted and cared for by children
4. Reduction in prices and self sufficiency in wood products
5. The ease of obtaining herbal medicines from trees within the villages

LAND AND SOILS

Definition

Land is a natural resource under certain ownership, where people, animals and crops are found. Soil on the other hand is the fine rock particles found on the surface of land which supports the farming activities. It could be fertile or infertile.

Goods and services provided by land and soils

Goods

1). Trees
2). Water
3) Grass
4). Stones for construction
5). Provide minerals
6). Food (mushrooms, white ants)
7). Provides bricks and tiles
8). Mud for smearing houses
9). Earth worms for fishing
10). Clay for pottery

Services

1). Sustain trees, livestock and crops
2). Income
3). Burial place
4). Human settlement
5). Facilitates transportation
6). Habitat for wildlife
7). Landscape as tourists' attraction

Changes that have occurred in land and soils during the last thirty years

1) Population has increased
2) Improved ways of farming
3) Destruction of vegetation due to construction
4) Soil infertility has increased due to continuous cultivation
5) Pests and diseases have increased.
6) Construction of roads
7) Emergence of striga weed
8) Monetary value of land has increased
9) Land subdivision has increased
10) Introduction of new varieties of crops
11) Disappearance of wildlife
12) Land grabbing
13) Change in land rights and ownership.
14) Many bore holes have been dug
15) Foreigners can own land
16) More are knowledgeable on better land use
17). Reduced livestock numbers
18) Rainfall patterns have changed because of tree felling

Causes of the changes that have occurred on land and soils

Reduced soil fertility

1. Continuous cultivation
2. Use of inorganic fertilizers
3. Cutting down trees, increasing soil erosion
4. Poor soil conservation methods

Reduction in livestock numbers

1. Sold to get money for school fees
2. Diseases caused by tsetse flies
3. Payment of dowry
4. Poultry diseases

Increased use of chemicals

1. Introduction of tobacco and horticultural crops growing

Deforestation

1. Tobacco growing (firewood for curing tobacco)
2. Charcoal burning
3. Timber demands for household use

Destruction of water catchment areas

1. Cutting of trees
2. Cultivation in the catchment areas
3. Cultivation of river banks

Effects of the changes on human livelihood

Soil infertility

Infertile soils result in poor crop yields leading to household food insecurity and insufficiency. The sequel is malnutrition and poverty.

Reduction in livestock numbers

This indirectly contributes to soil infertility due to lack of organic manure to ameliorate soil fertility. Reduced income from animal sales and low production predisposes the community to low household incomes and malnutrition. On a positive note, this encourages zero grazing and better land use patterns.

Land rights and subdivision

This has encouraged many people from other tribes to own land and has contributed to new knowledge on land use. Subdivision has led to small land parcels, necessitating improved farming techniques and soil conservation in order to get the maximum benefits

from the land. Women have been empowered and can own land which has led to new land use patterns and income generating activities like poultry keeping and agro forestry.

Improvements / destruction of water sources
More boreholes have been drilled thus availing clean and safe water to households. This has reduced the cases of water borne diseases. Due to the awareness created by health personnel on the importance of personal hygiene, more latrines have been dug thus improving household hygiene and sanitation.

Cutting of trees in water catchment areas has resulted in decline in springs water levels or drying of the springs altogether. This has caused women to travel long distances to fetch water or forced to use contaminated water sources. The former has led to disproportionate use of time and neglect of household chores bringing tension within households. The latter leads to infection with water borne diseases which, forces the households to spend the meager incomes in medical treatment's rather than paying school fees or investing in activities that would uplift household living standards This condemns such households to the vicious circle of poverty.

Deforestation
Cutting of trees has exposed the soil to wind and water erosion. This has led to infertile soils with poor yields. Because forests play a role in hydrological cycle, the destruction of forests has caused climatic changes leading to unreliable rainfall duration and amounts. The sequel is famine and poverty.

Use of pesticides
Growing of new cash crops like tobacco and cotton has led to intensive use of pesticides in order to increase quality, yields and income. The improper use of pesticides may result in human exposure and poisoning. Equally the pesticides may percolate down and contaminate underground water sources and also kill non-target organisms beneficial to the environment.

Indigenous knowledge used to mitigate the land and soils from the causes

Practicing land fallowing and shifting cultivation, which enabled the soils to replenish the depleted nutrients, improved soil fertility.

Crop pest and diseases were avoided by crop rotation, leaving land to fallow or use of pepper and *Mexican marigold* as insecticide to spray the affected crops.

A council of elders instead of magistrate's courts settled Land disputes.

Land boundaries were demarcated by planting sisal. Sisal planted in this manner helped to prevent soil erosion while the fiber was used to make ropes, mats and baskets.

Changes that have occurred due to or are likely to occur due to FITCA activities

FITCA has brought the following changes: -

1. Assisted farmers to acquire improved dairy animals
2. Reduction of tsetse flies by trapping. This has reduced the incidents of *Nagana* and sleeping sickness.
3. Introduced planting of new varieties of cassava and sorghum
4. Introduced construction of crutch pens for spraying cattle communally
5. Encouraged people to start zero grazing units and use treated nets to protect the animals in the pens from tsetse challenge.

Recommendations

1. *Institutionalize NEMA at village level*
   Formation of village environmental committees will help farmers manage their farms in an environmental friendly way. NEMA should train these committees in order to formalize NEMA activities at grass root level

2. *Sensitization of communities*
   Encourage communities to form "common interest groups" to deal with environmental issues like establishment of tree nurseries and woodlots at village level. Government departments or NGOs with similar interest should sensitize the community on environmental conservation measures as well as providing seedlings for establishment of nurseries of indigenous tree varieties

3. *Soil fertility*
   Train farmers on methods of composting manure, farmyard manure application and organic farming. This will improve soil fertility

4. *Soil erosion*
   Communities to be involved in soil conservation efforts like terracing and strip farming. Local environmental committees are to mobilize the community for these activities.

5. *Lack of cash crops*
   The relevant authorities and interested NGOs should make efforts to revive cotton, sugar cane industries and seed oil industries. Farmers should form cooperatives to market their produce.

6. *Increased crop pests*
   a. Practice organic farming
   b. Extension officers to training farmers on safe use of chemicals
   c. Introduction of pest resistant crops

7. *Deforestation*

Establish small woodlots of fast maturing trees in homesteads to provide wood fuel. Communities' be trained on use of fuel saving stoves like "*kuni mbili* and fireless *jiko*"

Indicators for measuring successful adoption of the recommendations

1. *Institutionalizing NEMA*
    a. Number of village committees formed

2. *Sensitization of communities*
    a. Number of established nurseries
    b. Increase in the number of trees that have been planted
    c. Number of households with woodlots
    d. Low prices and enhanced availability of wood products
    e. Number of common interest groups formed

3. *Soil fertility*
    a. Increased crop yields per unit area
    b. Increased housed hold food security- number of bags of food stored
    c. Number of farmer seminars conducted
    d. Number of farmers adopting soil conservation measures

4. *Soil erosion*
    a. Length of terraces dug
    b. Yield per unit area
    c. Existence of soil conservation committees
    d. Reduced area experiencing soil erosion

5. *Lack of cash crops*
    a. Number of farmer cooperatives organizations formed
    b. Increase in acreage under cotton, sugarcane and oil crops

6. *Increase in crop pests*
    a. Number of farmers practicing organic farming
    b. Number of farmer seminars held on safe use of agrochemicals
    c. Number of new pest resistant crop varieties introduced

7. *Deforestation*
    a. Number of households with established woodlots
    b. Number of training seminars held on the use of energy saving jikos
    c. Number of households using energy saving jikos

Observations

Land and soil issues were very sensitive to both communities. Concerns on poor productivity were articulated eloquently by the groups and concerted effort in soil conservation measures are needed to address the issue.

Deforestation has contributed heavily to soil erosion and infertility thus leading to poor crop yields. Agro forestry was recommended but constraints in establishing community tree nurseries and identification of the appropriate tree varieties for this purpose were a major concern.

Seminars on better land use and institutionalizing NEMA were recommended. It is important that communities' be empowered to realize their potential on how to solicit assistance from other stakeholders in order to actualize these seminars.

The lowest office of NEMA is at the district level. The participants felt that its effects will take long to be felt at village level and NEMA should have offices at village level and train village committees on how to reverse the trends on environmental issues they consider of priority. This will make environmental conservation everyone's problem. At the moment many do not know the existence of NEMA or understand the role of NEMA and how they are supposed to partnership at village level.

WETLANDS AND WATER

Definition

Wetlands are places with water all year round with exception of rivers and lakes. The papyrus grass "*liseme*" in Lusamia and "*epinat*" in Ateso grows in wetlands and is used for thatching. Human activities in wetlands involve growing of rice and sugarcane. Wetlands are habitats for frogs and earthworms.

Water is an important commodity for life. It is used for drinking, washing and irrigation among others. We find water in rivers, boreholes, streams, lakes and wells. A variety of fish species inhabit the waters.

Goods and services provided by water and wetlands

Goods from wetlands

1. Papyrus for thatching, making mats and ropes
2. Reeds for thatching, making baskets and fish traps
3. Earthworms for fishing
4. Clay for plastering houses and pottery
5. Fish
6. Grass for making traditional ash "*omukongolo*" and salt lick for animals "*sirongo*"
7. Bush meat from wild animals inhabiting the wetlands
8. Palm leaves for mats, baskets and ropes

Services

1. Cultivation of tomatoes, cabbages, sugarcane and arrowroots
2. Grazing land during dry season
3. Traditional vegetables obtained during dry season (*nasigumba, khasaka mugumbi)*
4. Fish farming (establishment of fish ponds)
5. Flood control
6. Plays a role in the hydrological cycle
7. Ameliorates temperatures

Goods obtained from water

1. Domestic use
2. Sand harvesting
3. Fish
4. Industrial use
5. Power generation

Services from water

1. Transport
2. Brick making
3. Habitat for fish and hippopotamus
4. Irrigation

Changes that have occurred in wetlands and water in the last thirty years

Table 3: Causes of the changes that have occurred in wetlands and water in the last thirty years

Change	Causes
Drying up of wetlands [n *]	1. Increase in population forcing people to cultivate 2. Poor farming methods leading to soil erosion and siltation 3. Deforestation, exposing wetlands to evaporation 4. Overstocking using wetlands as pastures 5. Planting of fast growing trees like Eucalyptus that take up a lot of water
Cultivation in wetlands [n&p]	1. Desire to Grow crops all year round (Food security) 2. Inadequate land 3. Unreliable rainfall 4. Wetlands have fertile soils
Decline in fish catches [n]	1. Over harvesting 2. Cultivation 3. Preyed upon by otters (*indugulu*) and monitor lizard (*imbulu*) 4. Decline in wetlands water level
Cutting of trees around wetlands [n&p]	1. Demands for wood fuel 2. Open wetlands for cultivation 3. Use trees for building 4. Cut trees for curing tobacco 5. Over harvesting for medicinal purposes.
Disappearance of wildlife [n&p]	1. Destruction of habitat forcing migrations 2. Hunting 3. Competition for grass with domestic animals

Disappearance of salt licks (sirongo) [n]	1. Cultivation of wetlands 2. Introduction of commercial salt licks 3. Covered by siltation from farm lands
Unreliable rainfall [n]	1. Deforestation 2. Cultivation of wetlands (play a role in hydrological cycle)
Disappearance of thatching grass [n]	1. Cultivation of wetlands 2. Wetlands turned to grazing areas 3. Burning of wetlands to open for cultivation 4. High demand by villagers
Water	
Scarcity of water sources [n]	1. Cultivation of wetlands 2. Deforestation 3. Cultivation of catchment areas 4. Drying up of springs and wells
Water pollution [n]	1. Wetland purifies water. Cultivation of wetlands means this service is unavailable 2. Contamination from humans and animals. 3. Pollution by agrochemicals
New water harvesting techniques [p]	1. In order to get safe water –piped water 2. Majority have no water frontage
Decline in water levels [n]	1. Increase in population causing high demand 2. Draughts 3. Deforestation 4. Siltation 5. Water weeds like hyacinth
Decline in fish numbers [n]	1. Pollution of rivers/streams 2. High demand for fish leading to over harvesting 3. Cannibalism among fish species

- [n] Changes with positive effects on human livelihood
  [p] changes with negative effects on human livelihood

The communities observed that although there are some individual benefits they gained from utilizing wetlands, the harm done to the environment affects all and out weighs the individualbenefitsgained.

Effects of the changes on livelihood

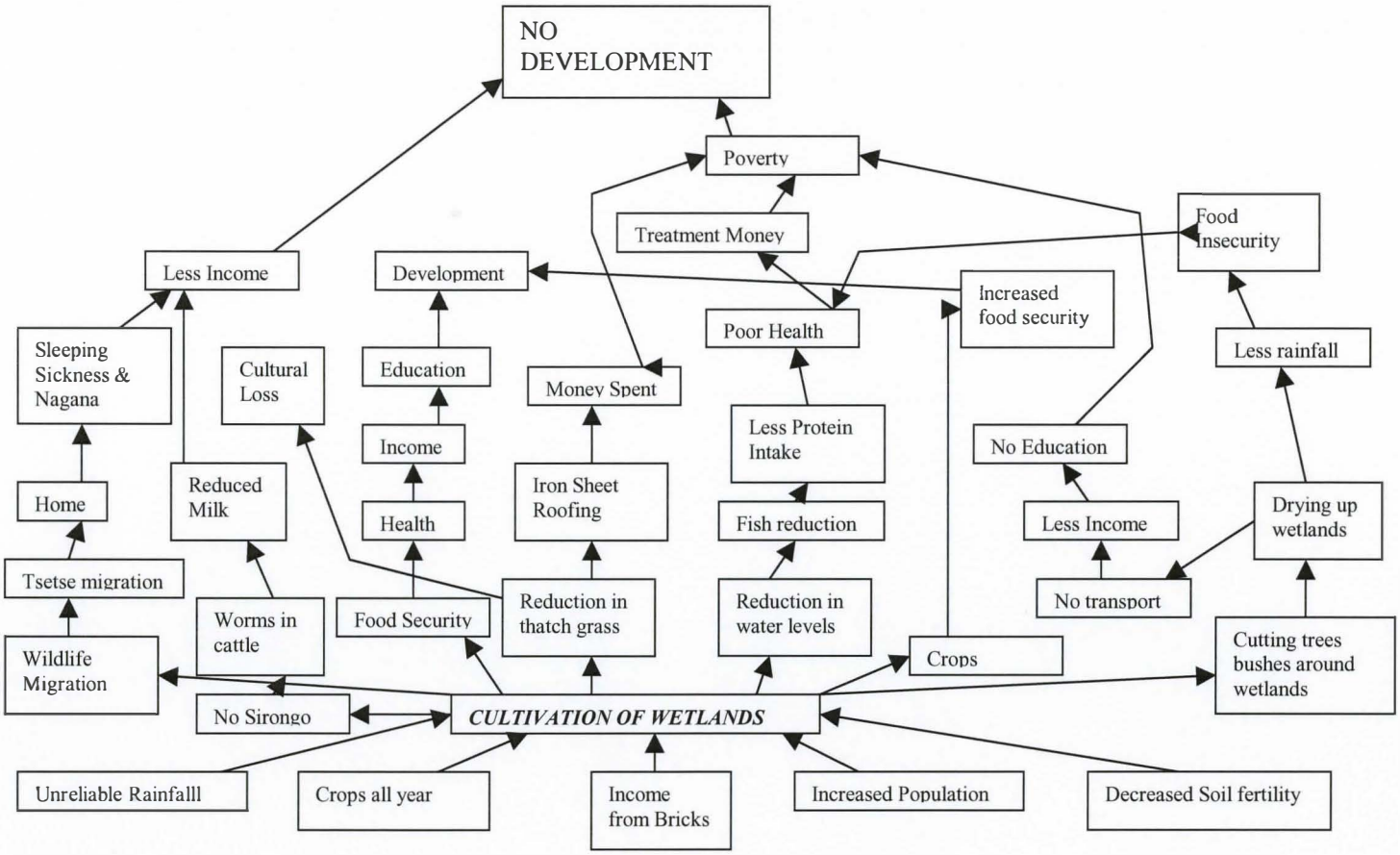


Fig. 4: The perception of the impacts of changes in wetlands and water by Busia township community, Busia District

How the changes have affected the incidences of sleeping sickness and Nagana

Drying up of wetlands, cultivation, disappearance of thatching grass and disappearance of wildlife cause tsetse flies to migrate to other habitats (like *Lantana camara,* river valleys and hills) and seek alternative hosts. This brings tsetse to habitats near homesteads increasing the likelihood of biting man and animals. All other changes have no effect on the incidences of sleeping sickness and *Nagana*.

Indigenous knowledge systems used to mitigate changes in wetlands and water

Drying up of wetlands
The population was not high as it is today. Therefore, there was no need to cultivate in the wetlands. Trees like "*emee*"and "*ebule*" growing in water sources were protected. There were vast grazing areas thus wetlands were not used as grazing lands. Elders used to reinforce the regulations and all respected their decisions.

Cultivation in the wetlands
People never used to cultivate wetlands as the population pressure to use wetlands was less and people believed that crops could not do well in the wetlands. Land parcels were larger, soils were fertile and rainfall was reliable. Wetlands were culturally associated with ancestral spirits and rituals for healing the sick were performed in the wetland areas, thus it was a necessary to protect them. In Samia (Busia), they believed that suckling mothers if they went to the wetlands, they would have high chances of contacting "*baya*" or pneumonia. In Teso, whenever the ritual of exhuming the remains of the dead (*emkutet*) was performed, the remains were placed under the "*emee*" tree. This meant that no one could cut such a tree.Wetlands were habitat to dangerous wildlife like foxes, pythons and leopards. The danger posed by these animals prevented many from cultivating the wetlands.

Decline of fish in wetlands
In the past, few people ate fish therefore fish numbers were high. Fishing was done seasonally and not all the year round. This was during the dry season when the bushes in the wetlands were burned down. The fishing techniques being employed today are detrimental to the maintenance of high fish population numbers, as some people are using poisonous plants that cause paralysis of the fishes both mature and the immature fingerlings. Factories to process fish did not exist and there was no over harvesting of even the immature in the quest for getting more income.

Cutting of trees in wetlands
If trees needed to be cut down, there was selective cutting of trees. Some of the trees (*omugogongo, omwalira akulu*, palm trees, *muronda ngombe* (Busia)) were never cut down. Other trees like " *murembe*" which means good was never cut as it was used culturally to curse those who offend others and was used to swear by it when resolving

conflicts. If you swore falsely under the *murembe* tree, then you would be cursed. The tree was believed to have curative power over diseases like mumps.

Disappearance of wildlife
The habitat for wildlife was not destroyed as it is today. Hunting was done by tying bells to dogs, which they used to get the animals out of the bushes. This in itself helped to chase the animals away and only the old or wounded ones were caught and killed. Bush burning was prohibited therefore protecting animal habitat. Some animals were selectively hunted, as they were a danger to poultry and livestock.

Abakhambi.and Abaguri clans in Busia believed they were related to monkeys and bongo respectively and as such they would not kill such animals.

Disappearance of thatching grass
The numbers of houses built then were fewer than today. Therefore the demand for the grass was less. Instead of cutting grass from wetlands they used to get grass from the dry land.

Water harvesting techniques
Water pollution was less as population was not as high as it is today and also only adults were allowed to fetch water thus reducing risk of contamination by children.

Reduction of water level
Cultivation on the river frontage was prohibited. Trees like eucalyptus, which use a lot of water, were never planted in water sources or frontage.

Changes that have occurred or likely to occur due to FITCA activities

FITCA activities

1. Deployment of traps and targets
2. Sensitization of communities on the importance of bush clearing around homesteads
3. Screening of animals
4. Training on new farming techniques (Cassava bulking, millet, sorghum and local chicken)
5. Organizing farmers into groups for spraying cattle
6. Training farmers on use of animal traction

Effects of the changes on wetlands
Deployment of traps will reduce tsetse population thus reclaiming these areas for cultivation and grazing. The long-term effect is drying up of the wetlands as water levels decline. Since the wetlands are involved in hydrological cycle, the rainfall will decline causing draughts leading to low crop yields and frequent famines. Destruction of the

habitat will lead to wildlife disappearance. More land will be available for grazing with a possibility of overstocking and the sequel will be soil erosion, infertility and siltation of the wetlands. As wetlands dry up and habitat change, this will cause tsetse to migrate to new habitats near homes resulting in increased challenge to humans and livestock.

Screening of livestock
This will result in treatment of the sick and increase in the number of livestock. This translates into higher returns. The possibility of overgrazing the wetlands exists, leading to dying up of the wetlands.

Building of crutches and spraying of cattle
This will reduce fly population resulting in healthy animals and more income. The increase in livestock numbers will lead to grazing in wetlands and destruction of wetland environment.
If the insecticide for spraying animals is not properly disposed off, possibility exists of polluting water resources and causing death of the fishes and other fauna.

Training farmers
This will expose the farmers to new farming techniques and new high yielding crop varieties. Adoption will result in households being self sufficient in food supplies and possibility of selling surpluses to add to the household income.

Recommendations and indicators for measuring their successful adoption

Cultivation of wetlands

1) Farmers to be trained on better ways of sustainable use of wetlands
2) Selection of suitably adapted crops and trees that should be planted to help conserve and protect wetlands.
3) Incentives to be offered to individuals who own large tracts of wetlands to encourage them to conserve and use wetlands in a sustainable way.
4) Education seminars to encourage family planning methods

Indicators

a. Number of farmers trained
b. Number of training seminars held
c. Number of techniques passes on and adopted
d. Type and species of trees and crop varieties planted and grown
e. Increase in the number of wetlands sustainably utilized and conserved
f. Decline in family size.

Disappearance of wildlife

1) Afforestation
2) Reintroduction of selected wildlife into the wetlands
3) Prohibit hunting until numbers build up

Indicators

a. The number of wetlands that have been restored.
b. Number of wetlands with reintroduced wildlife
c. Number and the different species reintroduced

Decline in fish species

1) Restock wetlands with fishes
2) Establish fish ponds
3) Train farmers on how to avoid water pollution
4) Use fishing techniques that selectively catch mature species
5) Stop cultivating wetlands

Indicators

a. Presence and number of fish caught from wetlands
b. Number of ponds established
c. Number of training seminars held
d. Number of farmers trained.

Cutting of trees from wetlands

1) Plant new species of trees
2) Stop draining wetlands

Indicators

a. Number of planted trees
b. Many trees growing in wetlands

Unreliable rainfall

1. Plant more trees around farms and homesteads
2. Stop cultivation in the wetlands

Indicators

1. Number of trees planted
2. Decline in number of wetlands under cultivation

Water pollution

1. Stop cultivation in the wetlands and river frontage
2. Plant trees in the farms, water courses and catchment areas
3. Adopt proper use and disposal of agrochemicals

Indicators

1. Increase in the quality of water
2. Number of trees planted in catchment areas.

OVERALL RECOMMENDATIONS

The recommendation to form village environmental committees and common interest groups by the communities is a clear indication of their interest in being engaged in addressing environmental issues. This interest needs to be harnessed in order for the villages to forge ahead and become referral points for other communities in the FITCA Kenya study region.

The communities in Angurai and Busia Township have for the duration of the workshop gone through a participatory engagement in discussing environmental issues that were very close to their hearts. The process has motivated them to take action to rectify the wrongs done. In order to take advantage of the interests in environmental conservation raised by the workshops, FITCA- EMMC needs to move in and engage the communities in developing action plans in a participatory way in cognizance of the themes and recommendations put forward. Below is a summary of recommendations that were applicable to both Angurai and Busia Township area.

Livestock and Wildlife

Disease control methods instituted by FITCA are bearing fruits to the community. The community needs to be partners with FITCA in order to make the control sustainable. More engagement with the community in developing control measures not only for *Nagana* but also for other diseases will increase animal productivity and household incomes.

Disappearance of wildlife from the two sites was attributed to habitat destruction. The communities need to start agro-forestry in order to attract wildlife back for posterity. The trees planted should be multipurpose in order for the community to harvest more benefits like fodder and fuel other than only recreating wildlife habitat.

Forests, Woodlands and Vegetation

The communities agreed that there are no more forests left in Angurai and Busia Township. Afforestation was recommended. The communities need to be assisted in identifying appropriate tree species and the establishment of tree nurseries to provide planting materials. Stakeholders with similar interests need to be identified and networked with the communities.

The recommendation for schools to set aside land where each child will plant and care for a tree should be encouraged. This will instill environment conservation discipline in the children at an early age and will lead to a population who are conscious of the need to conserve and protect the environment. This will bring the school management into environment conservation and will make them live by example they teach.

Land and Soils

The major concern was soil infertility. This problem requires training on better land use patterns that will reduce the risk of soil erosion and increase in ground cover to protect the fragile topsoil. The community needs to participate in developing action plans on how to arrest soil infertility and create network with stakeholders with interest in soil and water conservation who will help them realize their prioritized action plans.

Wetlands and Water

Cultivation in the wetlands was listed as the major cause of destruction of wetland environment. While the communities are not calling for total ban on wetlands utilization, better friendly and sustainable methods of utilization needs to be worked out in a participatory way in order to arrest further decline in the wetlands environment.

Afforestation both upland and in the wetlands will help prevent soil erosion, siltation and evaporation from wetlands leading to drying up of wetlands and disappearance of wildlife.

APPENDIX 1: Itinerary

16th November 2003	Traveling to Busia
17th -18th November 2003	Workshop in Angurai village- Teso
19th – 20th November 2003	Workshop in Busia Township area- Busia
21th November 2003	Traveling back to Nairobi

APPENDIX 2: Check list of questions to guide theme discussions

Plenary on Environment and Natural resources

Objective: Build consensus

- What is environment?
- What constitutes the environment?
- List the components of the environment.
- List the natural resources common in this area.
- Which of these are useful and list those that are not directly useful but necessary for the society?

1. Working Group on Forests, Woodlands and Vegetation.

- List the products and services obtained or could be obtained by your community from woodlands and vegetation.
- What are the changes that have taken place in the woodlands and vegetation over the last thirty years?
- Which of these have positive or negative effects?
- What were the causes of these changes and their impact on human livelihood?
- How have these changes affected incidences of sleeping sickness and Nagana?
- What indigenous knowledge systems were employed to mitigate these causes?
- What changes are directly related to FITCA activities or are likely to be caused by FITCA activities?
- Make recommendations to mitigate the negative changes indicated above.
- How do we assess the impact of our interventions?

2. Working group on Wetlands and water

- List the goods and services provided by wetlands and water to the communities.
- What changes have taken place in wetlands and water in the last thirty years?
- Which of these changes have had beneficial or detrimental effects?
- What were the causes of these changes and how do they or have they impacted on human livelihoods?
- How have these changes affected incidences of sleeping sickness and Nagana?
- What indigenous knowledge systems were employed in the past to mitigate against these causes?
- Which changes are directly related to FITCA activities or are likely to result from current FITCA activities?

- Make recommendations to mitigate these negative causes of change witnessed or likely to occur in wetlands and water in the future.
- How do we assess the impact of our interventions?

3. Working group on land and soil

- What are the goods and services provided by land / soil?
- What are the changes that have occurred in land and soil in the last thirty years?
- Which of the changes have had positive or negative impacts?
- What are the causes of these changes and have they or are they likely to impact on human livelihoods?
- How have these changes affected incidences of sleeping sickness and Nagana?
- What was the indigenous knowledge systems used to protect land /soil from these changes?
- Which changes are likely to occur or have been caused by FITCA activities?
- Make recommendations on how to militate against these changes that are likely to occur or have occurred in land and soil.
- How do we assess the impact of our interventions?

4. Working Group on Livestock / Wildlife

- List the goods and services provided by livestock / wildlife and insects to communities.
- What changes have occurred in this component of the environment in the past thirty years?
- Which have had positive or negative effect?
- What caused these changes?
- How have these changes affected human livelihoods?
- How have these changes affected incidences of sleeping sickness and Nagana?
- What was the indigenous knowledge systems used to protect livestock and wildlife from the changes witnessed?
- Which changes are likely to occur or have occurred due to FITCA activities?
- Make recommendations on how to mitigate these changes that are likely to occur and also how to renege those that have occurred?
- How do we assess the impact of our interventions?

APPENDIX 3: List of participants

ANGURAI

Kasinge A Village

Simon E. Omuse
Francis Epalat
Elizabeth Oridi
Anna Atyang
Francisca Mukute
Fred Miriago
Dibirah Imoni
Paul Emase
Francis Okwamong
Joseph Onyapidi
Lucy Omokode
Winfred A. Bakira
Bernard Okware
Christine Atyang
Josephat Muriago

Kaejo Village

Charles O.Shem
Consolata Amukaga
Ann Nelima
Desmon Omuse
Maximilla Abukui
Leonard Emojong
Gertrude Inyele
Augustun Emojopng
Zakayo Emoir
John Papa
Justus Anyaun
Godfrey Oroni
Bernard Emukule
Collins Omoit
Tofista Ajaa

Moru-Keneran village

Jimmy Oswana
William Esike
Herman Idachi
Nicodimus Barua
Gladys Onyapidi
Mary Nafula
Donald Emase
John Omoiti
Dan Ipara
Willy Orupia
Roshiel Okiringi
Margaret Matei

Kakurikit Central Village

(13 participants)

Aukot village

Godfrey Papai
Benjamin Ajelo
Patricia Omurocho
Dennis Eriyama
William Zekita
Christine Okemeri
Jael Olima
Caro Murunga
Moses Masangiri
Areti Nico
Okaale Murunga
Eligama Imeta
Alfred Omoiti
Saif Askiata

Interpreters
Joseph Etyasng- Laboratory Technician KETRI
Godfrey Emase - Laboratory Technician KETRI
Alex Ekitoi – divisional Veterinary Officer
Mark Juma

BUSIA TOWNSHIP

Nangwe Village
Benedict Opole
Pascalia Wanjala
Alex Opole
Zaverio Wanyama
Rita Ouma
Victor Wandere
Leonora Egessa
Titus Nyangweso
Bonz Wandidwa
Hillary Okumu
Shadrack Mupadia

Mayenje Village
Benson Audo
Jason Were
John Odiaka
Wycliffe Nambiro
Venswa Okumu
Divas Kwoba
Dickson Maseti
Livingstone Wandera
Mary Wasike
Wilson wabwire
Moses Maside
Mary Wasike

Bulunda/ Burumba villages
Clement Akulobi
Mary Oruko
Margaret Egesa
Arusi Ogola
Margaret Owoko
Walter Masiga Kapulie
Sella Wanjala
Janepher Wanyama
Susan Adego
John Otiato
Africanus Busera
Benson Makutwa

Siteko/ Mabale Villages
Nicholas Dundo
Patrick Wasike
Africanus Wanyama
Joseph Osinya
John Ouma Odera
Charles Juma Mbwori
Michael Ramoya
James Otieno
Constant Okumu
Linus Apusai
Jacob Khabi
Jacob Omula
Alex Musungu
Julie Mujera
Charles Dundo
Leonida Nekesa
Joseph Oundo

Bwamani Village

Justo Oundo
Redempta Oundo
Makulata Nabwire
Godfrey Wandera
Florence Dede
Vincent Odanga
Justus Odongo
Shadrack Egesa
John Mudiedie
Chrispinus Obola
Resulla Obonyo
Jacob Mbanda
Peter Egokhe
Michael aleke
Charles Obonyo

Interpreters

Jane Angana - Divisional Home Economics Officer
Hillary Musumba - Divisional Water and Soil Conservation Officer
J. Ongoma – FEW Mayenje